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Study of the Fast X-Ray Transient XTE J1901+014 Based on INTEGRAL, RXTE and ROSAT Data

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The source XTE J1901+014 discovered by the RXTE observatory during an intense outburst of hard radiation and classified as a fast X-ray transient is studied. The source's spectral characteristics in the quiescent state have been investigated for the first time both in the soft X-ray energy range (0.6-20 keV) based on ROSAT and RXTE data and in the hard energy range ($>$ 20 keV) based on INTEGRAL data. A timing analysis of the source's properties has revealed weak nonperiodic bursts of activity on time scales of several tens of seconds and two intense ($\sim$0.5-1 Crab) outbursts more than several hundred seconds in duration. Certain assumptions about the nature of the object under study are made.

Key words: fast X-ray transients, outbursts, neutron stars, black holes, XTE J1901+014.

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INTRODUCTION

XTE J1901+014 was discovered by the All-Sky Monitor (ASM) of the RXTE space observatory during the outburst of April 6, 2002, when the photon flux from this source reached 0.9-1.2 Crab in the energy range 1.5-12 keV. Because of technical peculiarities of the ASM observations, it proved to be possible to determine only the limiting outburst duration interval: > 2 min and < 3.15 h. The J2000.0 coordinates of the source are R.A. = $19^h\ 01^m\ 46^s$ and DEC = $+1°24'15''.7$; the localization accuracy is $\sim 3'$ (Remillard and Smith 2002). No conclusion about the nature of the source was reached, but it was pointed out that the time profile of the outburst was similar to the time profiles of the outbursts observed from the microquasar V4641 Sgr. When analyzing the archival ASM data, Remillard and Smith (2002) pointed out the presence of a previous outburst from the object under study occurred in July 1997 with a flux of $0.4-0.5$ Crab in the energy range 1.5-12 keV and a duration of > 6 min and < 8 h. No other equally intense outbursts from the source have been detected.

Using the ROSAT catalog, Remillard and Smith (2002) established that 1RXS J190141.0+012618 localized by the PSPC instrument with the coordinates R.A. = $19^h\ 01^m\ 41^s$ and DEC = $+1°26'18''$ is located within the ASM/RXTE error region of the source XTE J1901+014. Analysis of the archival ROSAT/HRI data showed that 1RXS J190141.0+012618 was also detected at a statistically significant level during the observing session of October 3, 1994. However, its position was slightly displaced from the position initially determined by ROSAT/PSPC (the ROSAT/HRI position of the source is R.A. = $19^h\ 01^m\ 40^s.1$ and DEC = $+1\ 26'30''$; the localization error is $10''$). It was assumed that 1RXS J190141.0+012618 and, after a refinement of the position using ROSAT/HRI-1RXH J190140.1+012630, and XTE J1901+014 are the same object, or the ROSAT source is the nonflaring counterpart of the transient XTE J1901+014 (Wijnands 2002). However, because of the relatively large uncertainty in the position of XTEJ 1901+014, this assumption needed additional testing.

In this paper, we analyze a large number of observations of XTE J1901+014 at different times by the INTEGRAL, RXTE, and ROSAT observatories, refine the position of the source, and obtain and investigate the energy spectrum of the source in the quiescent state over a wide energy range, $0.6-100$ keV, and its light curves for the first time. Preliminary results of this study were published previously (Karasev et al. 2006).

OBSERVATIONS

In this paper, we use data from the ISGRI detector (Lebrun et al. 2003) of the IBIS gamma-ray telescope onboard the INTEGRAL space observatory (Winkler et al. 2003), the ASM monitor and the spectrometer onboard the RXTE space observatory (Bradt et al. 1993), and the PSPC-C telescope on-board the ROSAT space observatory.

The effective energy range of the ISGRI detector is from 15 to 200 keV, its angular resolution is 12 arcmin, and the localization accuracy of point sources varies between $\sim 30''$ and several arcmin, depending on their intensity. Other telescopes and detectors of the INTEGRAL observatory (JEM-X, PICsIT/IBIS, and SPI) failed to detect the source at a statistically significant level. The operating energy ranges of the PCA/RXTE spectrometer and the ASM/RXTE monitor are 3-20 keV and 1.3-12.2 keV, respectively; the sensitivity of the latter is ∼20 mCrab. Because of the short exposure time, the source was not detected by HEXTE/RXTE at a statistically significant level. The PSPC-C/ROSAT telescope has a $57'$ field of view and is capable of detecting photons with energies 0.1-2.4 keV.

The method of image reconstruction and spectral analysis of the ISGRI data used in this paper was described by Revnivtsev et al. (2004) and Lutovinov et al. (2003). We reduced the observations with the RXTE and ROSAT instruments using the standard set of codes included in the HEASOFT 6.0 software package. The calibration data and the response matrix for PSPC-C/ROSAT were taken from the standard CALDB library. The background model for was chosen by taking into account the fact that a weak source was studied. Table 1 lists the dates, observation numbers, and orbits that were used in our analysis as well as the ISGRI, PCA, and PSPC-C exposure times. The publicly accessible ASM/RXTE data for the source under study obtained from January 1996 through January 2006 were taken from the archive at http://xte.mit.edu.

We reduced the PSPC-C/ROSAT all-sky survey data in accordance with the standard PSPC data reduction technique for sources in the field of view of the instrument slightly displaced from its center and using recommendations from Belloni et al. (1994).

When reducing the PCA/RXTE data, we took into account the change in the source's detection efficiency with its position in the field of view of the instrument related to the collimator peculiarities (Jahoda et al. 2006). The deviation of the optical axis of the spectrometer from the direction toward the source varied between $\sim 1.2'$ and $\sim 7'$ during the observations; this deviation was corrected by multiplying the collimator efficiency by an appropriate conversion factor. It should be noted that the PCU4 detector module of the PCA spectrometer was switched off during the entire observation no. 30186; only three (PCU0, PCU2, PCU3) of the five detector modules operated during observation no. 70409. Although PCU0 has had no propane veto layer, which greatly reduced the background effect on the results obtained, since 2000, we used its data in our analysis, because a separate analysis of the behavior of this detector module revealed no significant anomalies that could distort the results of observations. Note also that we used data only from the two upper anode layers for each PCU.

When the spectrum of the source under study was reconstructed, it was necessary to take into account the influence of other sources that fell within the PCA field of view during certain observations and the Galactic ridge X-ray emission, because XTE J1901+014 (with Galactic coordinates: $l = 35.38°$, $b = -1.62°$) falls into a region where its influence is significant (Revnivtsev et al. 2006).

In observation 30186-01-16-05S, apart from XTE J1901+014, the X-ray pulsar XTE J1858+034 with a deviation of $59'.332$ from the optical axis fell within the PCA field of view. To properly reconstruct the spectrum of the source under study from the combined spectrum of the sources based on observation 30186-01-16-05S, it was necessary to subtract the spectrum of the pulsar XTE J1858+034. Assuming that the shape of the latter remained unchanged, we calculated it using observation 30137-01-01-15S, during which, according to the ASM data, the pulsar's intensity was the same as that during the observation of XTE J1901+014. We subtracted the pulsar's spectrum by taking into account the PCA collimator efficiency for a deviation of $59'.332$ from the optical axis (Jahoda et al. 2006); as a result, the flux from it was multiplied by a factor of 0.03.

To taken into account the influence of the Galactic ridge X-ray emission, we used the fact that the time of observation 30186-01-16-05S is divided into two parts: slewing to the object and observation of the object itself. During the slewing, the PCA axis moved along the Galactic parallel b=$\sim -1.5°$, with the longitude changed from $\sim 14°$ to $\sim 35°$ (Fig. 1). Having chosen the times when no point sources fell within the PCA field of view, we mark the level of persistent radiation at this parallel that is the ridge X-ray emission. However, since the duration of one slewing is too short to construct a statistically significant spectrum of the ridge X-ray emission, an additional analysis of the emission near the source as close to the Galactic plane as possible, since its intensity is higher there, was required. The validity of this approach follows from the results of Revnivtsev et al. (2006), who point out that the shape of the spectrum of the ridge X- ray emission is constant at different Galactic latitudes and longitudes. This is because this emission has the same nature in any part of the galaxy. In addition, the intensity of the ridge X-ray emission depends weakly on longitude in the longitude range under consideration.

To perform the required analysis of the ridge X-ray emission, we can use data from slewings, pointings to source-free regions, or pointings to transient sources in the off state. We used the latter method, because the best exposure was achieved in this case and, as a result, the most significant spectrum of the ridge X-ray emission was obtained. For our analysis, we took observation no. 30141-05-11-00 of the transient X-ray pulsar GS 1843-02 performed at longitude l=$\sim$31°and latitude b=$\sim$-0.5°in which the lowest intensity of the emission from this sky region was recorded. The absence of $\sim$94s pulsations characteristic of this source and the characteristic shape of the spectrum corresponding to the on state was considered as an indicator that the pulsar was in the off state. Thus, the flux recorded in this observation corresponds to the flux of the ridge X-ray emission proper.

To additionally confirm the validity of the results obtained, we analyzed observation no. 30416-01-01-02S of the NEW_PULSAR_NEAR_SCUTUM region, in which GS 1843-02 in the off state fell within the field of view of the spectrometer with a deviation of $\sim 45'$from the optical axis and there were no other sources in the field of view. As a result, we obtained a spectrum similar to that measured when analyzing observation no. 30141-05-11-00, but with a lower statistical significance (due to a shorter exposure time). This confirms the correctness of the chosen method for calculating the spectrum of the ridge X-ray emission.

It should be noted that in observation no. 30141-05-11-00, apart from the pulsar GS 1843-02, the pulsar PSR J1846-0258 was at the edge of the field of view (the deviation from the optical axis is $\sim 44'$) from which persistent radiation was detected at a level of $\sim$2-2.3

mCrabm and which is not transient. However, our estimates showed that its contribution to the total flux recorded by PCA in this observation did not exceed 10%.

We constructed the spectrum of the ridge X-ray emission from all of these data with the intensity recalculated for the latitude of the source under study and then subtracted it from the combined spectrum measured by PCA in the observations of Table 1.

For the subsequent spectral analysis, we used two spectra of XTE J1901+014 taken in the energy range 3-20 keV by the method described above from the PCA observational data of 1998 and 2002, the combined hard spectrum taken with the ISGRI/INTEGRAL detector at energies above 20 keV in 2003-2004, and the 0.6-2 keV PSPC-C/ROSAT spectrum. For our timing analysis, we used PCA/RXTE light curves with a time resolution of 16 s and 0.125 s to investigate the rapid variability and ASM/RXTE data to investigate the long-term variability.

LOCALIZATION AND THE OPTICAL COUNTERPART

XTE J1901+014 fell repeatedly within the IBIS/INTEGRAL field of view in 2003-2004 during deep observations of the Sagittarius Arm tangent. This allowed the source to be detected at a high confidence level ($> 20\sigma$, Fig. 2a) and the accuracy of its localization to be improved considerably ($\sim 1.2'$) compared to the ASM results. Note that 1RXH J190140.1+012630 also confidently falls into the new error region of the source under study (Fig. 2b), with the distance from the localization center of XTE J1901+014 to 1RXH J190140.1+012630 being no larger than $0.3'$. The results obtained suggest with a high probability that these two sources are identical.

The optical counterpart of the source under study is difficult to find and identify, because it is close to the Galactic plane. In particular, having analyzed the DSS (Digital Sky Survey) maps and their own optical observations, Powell et al. (2002) suggested that the blue star with the (J2000) coordinates R.A.= $19^h\ 01^m\ 39.^s90$, DEC= $+01^\circ 26' 39''.2$ (source #1 in Fig. 3b) is the optical counterpart of the source. A further analysis of the 2MASS data (http://irsa.ipac.caltech.edu/applications/2MASS) revealed another source, 2MASS J19013983+ 0126325 (source #2), in the error region of 1RXH J190140.1+01263. This source is slightly closer to the position of the X-ray source (cf. Figs. 3a, 3b, and 3c) and considerably brighter in the infrared than source #1 mentioned above (Fig. 3c). Note that source #2 is considerably fainter in the optical bands and shows up only in the I band (Fig. 3b). Comparative characteristics of the two presumed counterpart stars are listed in Table 2.

LIGHT CURVES

First of all, note that no activity similar to the 1997 and 2002 events was found in the archival ISGRI/INTEGRAL and PCA/RXTE data for XTE J1901+014. Analysis of the

ASM light curves showed that no statistically significant flux was detected from the source outside outbursts by this instrument and there was no long-term variability.

According to the ASM data, the flux from the source during the outburst in June 1997 did not exceed the background level in the energy range 1.5-3 keV, was $\sim$ 0.13 Crab in the energy range 3-5 keV, and reached $\sim$ 0.7 Crab in the energy range 5-12 keV. This hard outburst was observed for 270 s, which corresponds to three standard 90-s intervals of ASM observations (Fig. 4a). The outburst in April 2002 was observed during two standard intervals of observations. The measured peak flux was higher than that in the previous case, $\sim$1.1 and $\sim$1.2 Crab in the energy ranges 3-5 keV and 5-12 keV, respectively. The 1.5-3 keV flux from the source, $\sim$0.8 Crab, also exceeded significantly the background level (Fig. 4b).

As was noted above, no flux was recorded by ASM from XTE J1901+014 in the quiescent state because of its insufficient sensitivity. However, analysis of the source's observations with more sensitive instruments, the PCA spectrometer onboard the RXTE observatory and the IBIS telescope onboard the INTEGRAL observatory, has allowed us to detect a weak persistent radiation from the source for the first time. The intensity of this emission proved to be the same both in the two series of RXTE observations of the source in 1998 and 2002 and during its INTEGRAL hard X-ray observations in 2003-2004; it was $\sim$ 2.7 mCrab in the energy ranges 3-20 keV and 17-100 keV, respectively.

All of the PCA/RXTE observations show a certain temporal variability, a series of activity bursts $\sim$40-60 s in duration with the peak flux ranging from 7 to 9 mCrab (Fig. 5). No periodicity in the occurrence of these bursts was found.

THE SPECTRUM

The Quiescent State of the Source(Persistent Radiation)

Despite the relatively short PCA/RXTE exposure time for XTE J1901+014 (see Table 1), we managed to reconstruct high-quality spectra of persistent radiation from the object for both series of observations of the source in 1998 and 2002. Comparison of the spectra obtained showed them to be virtually identical in both shape and flux. This gave us grounds to analyze the source's spectrum averaged over all observations. The technique for properly reconstructing the spectra of sources located near the Galactic plane is described in detail in the "Observations" Section. The extent to which the Galactic ridge X-ray emission affects the actual spectrum of the source and the importance of its allowance are demonstrated in Fig. 6. This figure shows the combined PCA spectrum (Fig. 6a), the spectrum of the Galactic ridge X-ray emission at the latitude of the object under study (Fig. 6c), and the true spectrum of XTE J1901+014 in the energy range 3-20 keV (Fig. 6b).

We further analyze the spectrum obtained using the XSPEC software package (http://heasarc.gsfc. nasa.gov/docs/xanadu/xspec/index.html). In our analysis, we took into account the 1% systematic error related to the data reconstruction using software. The spectrum was fitted by a power law,

$$A(E) = K \times (E/1keV)^{-\Gamma}$$

where Γ is the photon index and K is the normalization of photons/keV/cm^{-2}/s to 1 keV.

Using the PSPC-C/ROSAT all-sky survey data, we managed to obtain a statistically significant spectrum of the source in the energy range 0.6-2 keV whose normalization closely coincides with that of the PCA (3-20 keV) spectrum. However, to describe the combined PSPC-PCA spectrum, apart from the power law, the introduction of an interstellar absorption factor $M(E) = exp(-n_H \times \sigma(E))$, where $\sigma(E)$ is the absorption cross section (without Thomson scattering), was required. According to our analysis, this absorption toward the source in question corresponds to a hydrogen atom column density of $n_H = 3.4 \times 10^{22}$ atoms cm^{-2} . As a result, we obtained the following best-fit parameters:$\Gamma = 2.26 \pm 0.03$, $K = 0.044 \pm 0.002$, $\chi^2 = 0.63$ (43 d.o.f.). The solid line in Fig. 6b indicates the model described by these parameters.

The hard X-ray ($>$ 20 keV) spectrum of the source obtained from ISGRI/INTEGRAL data is also described well by a power law with the same slope. Given the constancy of the source's spectrum in the energy ranges 0.6-2 keV and 3-20 keV as well as the identical shape of the spectrum and fluxes above and below 20 keV, it would be natural to assume that the shape of the source's spectrum is also constant over a wide energy range, 0.6-100 keV. In this case, the broadband spectrum of the object under study (Fig. 7) can be obtained by combining the ROSAT, RXTE, and INTEGRAL data. For this purpose, in the XSPEC package, the ISGRI/INTEGRAL spectrum was added to the PSPC-C/ROSAT and PCA/RXTE spectra with a free normalization and jointly fitted by a power law. This fit showed that the spectra have not only identical photon indices, but also identical normalizations. This confirms our assumption about the constancy of the flux and shape of the spectrum of persistent radiation from XTE J1901+014 over a wide energy range.

Analysis of the source's spectrum during its activity bursts in observations 30186-01-16-05 and 30186-01-21-01 revealed no changes in its shape; only the flux varied.

OUTBURSTS (ASM data)

Based on ASM calibrations using PCA data, Smith et al. (2002) showed that the slope for sources with power-law spectra (and, in particular, for black hole candidates) could be estimated using the ratio of the count rates in two ASM hard energy channels (3-5 keV and 5-12 keV):

$$\Gamma_{ASM} = 1.499 \times R + 0.698,$$

where R is the ratio of the count rate in the 3-5 keV channel to the count rate in the 5-12 keV channel.

By recalculating the flux ratios for all 90-s intervals in which the source was detected by ASM, we can roughly trace the evolution of its spectrum during both outbursts. Whereas during the outburst of July 1997 the source's spectrum was fairly hard and virtually constant with ASM $\Gamma_{ASM} \sim 1.2$, in April 2002 the spectral slope changed from $\sim 2.4 \pm 0.1$ in the first ASM observing interval to 1.4 ± 0.1 in the second interval. Such a different spectral behavior of the source may stem from the fact that the RXTE observatory observed different phases of the outbursts in 1997 and 2002.

CONCLUSIONS

Our timing and spectral analyses of the intense outbursts in 1997 and 2002 lead us to conclude that these are most likely not the type I bursts associated with thermonuclear explosions on the surfaces of neutron stars, because, in contrast to the latter, either their hardness does not change with time or they become even harder.

A joint analysis of the INTEGRAL, RXTE, and ROSAT data has allowed us to construct for the first time a broadband (0.6-100 keV) energy spectrum of the object under study, which is well fitted by a power law with a photon index of ~2.26. Neither cutoffs at energies 20-30 keV, which are characteristic of X-ray pulsars (see, e.g., Filippova et al. 2005), nor, after allowance for the contribution from the Galactic ridge X-ray emission, any emission lines have been found in the source's spectrum. Such a nonthermal spectrum without any evidence of a cutoff may indirectly indicate that the compact object in the system under consideration is a black hole.

No long-term variability has been found in the behavior of XTE J1901+014. However, short-term aperiodic variability was detected in the energy range 3-20 keV as a series of activity bursts $40-60$ s in duration whose peak flux exceeded the flux from the source in the quiescent state by a factor of $1.5-3$. The spectral shape of the source during these bursts remains the same as that in the quiescent state.

The intense outbursts detected from XTE J1901+014 are similar in timing and spectral characteristics to the well-known outbursts from V4641 Sgr (Stubbings and Pearce 1999), Cygnus X-1 (Golenetskii et al. 2003), and, to a lesser degree, the outbursts from such fast X-ray transients as SAX J1818.6-1703 (Grebenev and Sunyaev 2005). The comparative parameters of the sources and their outbursts are listed in Table 3.

To summarize, we may assume that XTE J1901+014 belongs to the class of fast X-ray transients with a black hole as the compact object. However, further observations in various wavelength ranges, primarily in the soft X-ray and optical ranges, are required to determine the nature of XTE J1901+014.

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Table 1. Instruments and observations

Observatory/ instrument	Observation	Date of observation	Effective exposure time,ks
PSPC-C/ROSAT	RASS 3/17/51	17/09/1990	∼0.55
PCA/RXTE	30186-01-21-01Z	11/09/1998	∼0.120
PCA/RXTE	30186-01-21-01A	11/09/1998	∼0.12
PCA/RXTE	30186-01-16-05S	23/09/1998	∼1.2
PCA/RXTE	70409-01-01-05Z	21/04/2002	∼0.15
PCA/RXTE	70409-01-01-05S	21/04/2002	∼0.06
ISGRI/INTEGRAL	orbits 48-70	March-May 2003	∼1400
ISGRI/INTEGRAL	orbits 121, 128, 131-135	October-November 2003	∼219
ISGRI/INTEGRAL	orbits 172-177, 185-188, 193	March-April 2004	∼610

Table 2. Possible counterparts and their magnitudes

star number	B	V	R	I	J	H	K
1	21.16[a]	18.72[a]	19.65[a]	18.01[a]/18.263[b]	16.439[b]	-	-
2	-	-	-	18.1[b]	13.2[c]	11.3[c]	10.4[c]

Note. The magnitudes in the table are given in accordance with the following data: a –JKT (Jacobus Kaptyn Telescope, Powell et al. 2002); b –the DENIS catalog (http://vizier.ustrasbg.fr/viz-bin/VizieR-3); c –the 2MASS catalog.

Table 3. Comparative characteristics of XTE J1901+014 and known fast X-ray transients

Comparative characteristics	XTE J1901+014	V4641 Sgr	SAX J1818.6-1703
Duration of outburst	$>$ 2 min $<$ 3.15 h (06/04/2002)	$\sim$16 h (15/09/1999)	$\sim$23 h (09/09/2003)
Flux in the maximum	0.5-1.2 Crab (1.5-12 keV)	$\sim$12 Crab (1.5-12 keV)	$\sim$380 mCrab (18-45 keV)
Change in hardness during out (H=ASM$_{5-12keV}/ASM_{3-5keV}$)	H from $\sim$1 to $\sim$2.75 at maximum	H from $\sim$1.78 to $\sim$2.82 subsequently from $\sim$2.82 to $\sim$1.21	increased in the energy range
Presence of other similar outbursts	27/07/1997	equally intense not observed	11/03/1998 09/10/2003 10/10/2003 (Sguera et al. 2005)
Presence of persistent flux	$\sim$2.7 mCrab (0.6-100 keV)	?	not detected at statistically significant level
Variability of persistent flux	short-term aperiodic	intense burst activity	-
Type of object	-	binary system with black hole	-
Companion Sp, m	?	B9, $\sim$5-8 M$_\odot$	B3

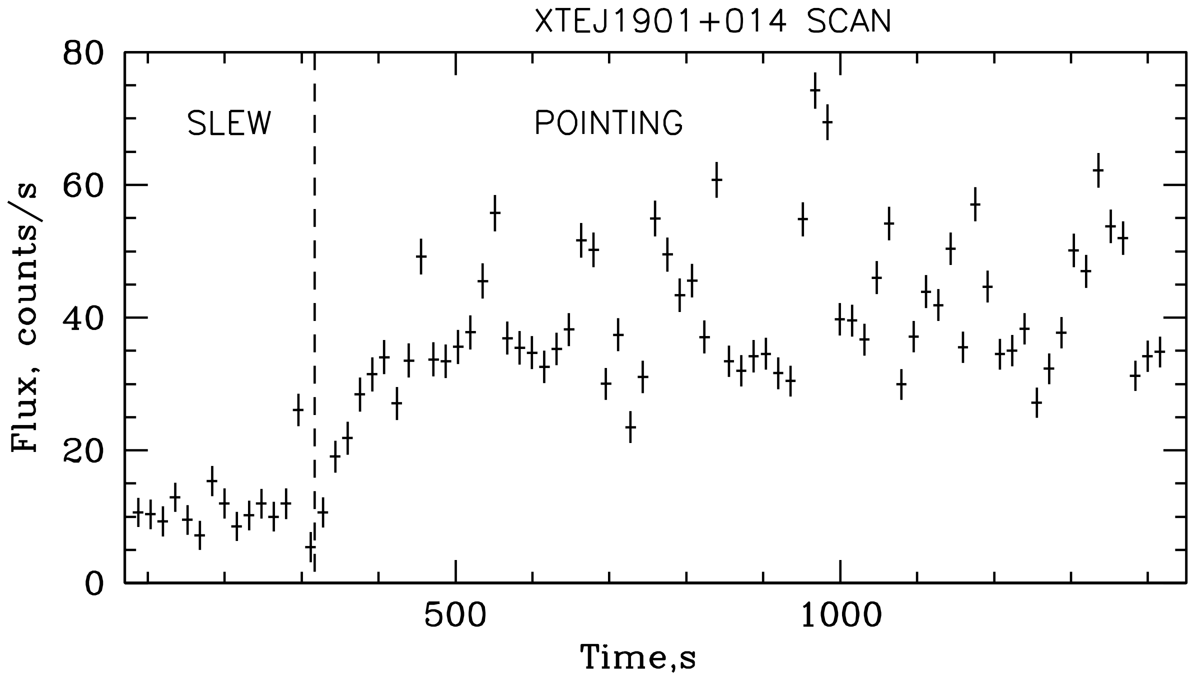

Fig. 1: Light curve of XTE J1901+0.14 obtained from PCA/RXTE observation 30186-01-16-05S, which reflects the variations in the recorded 320 keV flux related to the displacement of the PCA field of view: slewing to the source and the source's observation proper at a PCA/RXTE fixed field of view to the left and the right of the dashed line, respectively.

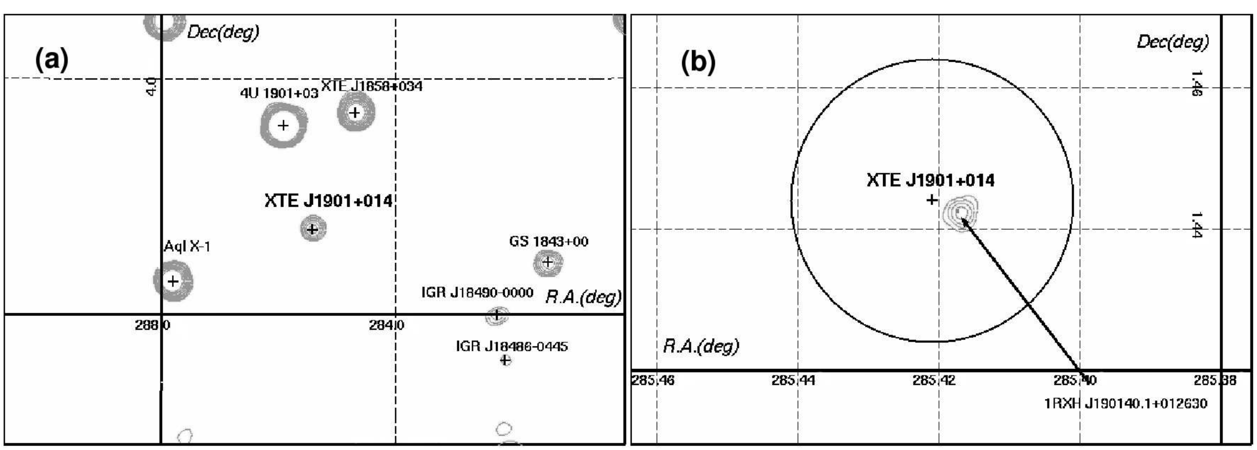

Fig. 2: Images of the sky region containing XTE J1901+014 obtained from ISGRI/INTEGRAL data in the energy range 18100 keV (a) and from HRI/ROSAT data in the energy range 0.12.4 keV (b). The latter image also shows the ISGRI/INTEGRAL localization center of the source and the error circle of this instrument (with a radius of ∼1.2′). The intensity contours indicate the position of 1RXH J190140.1+012630.

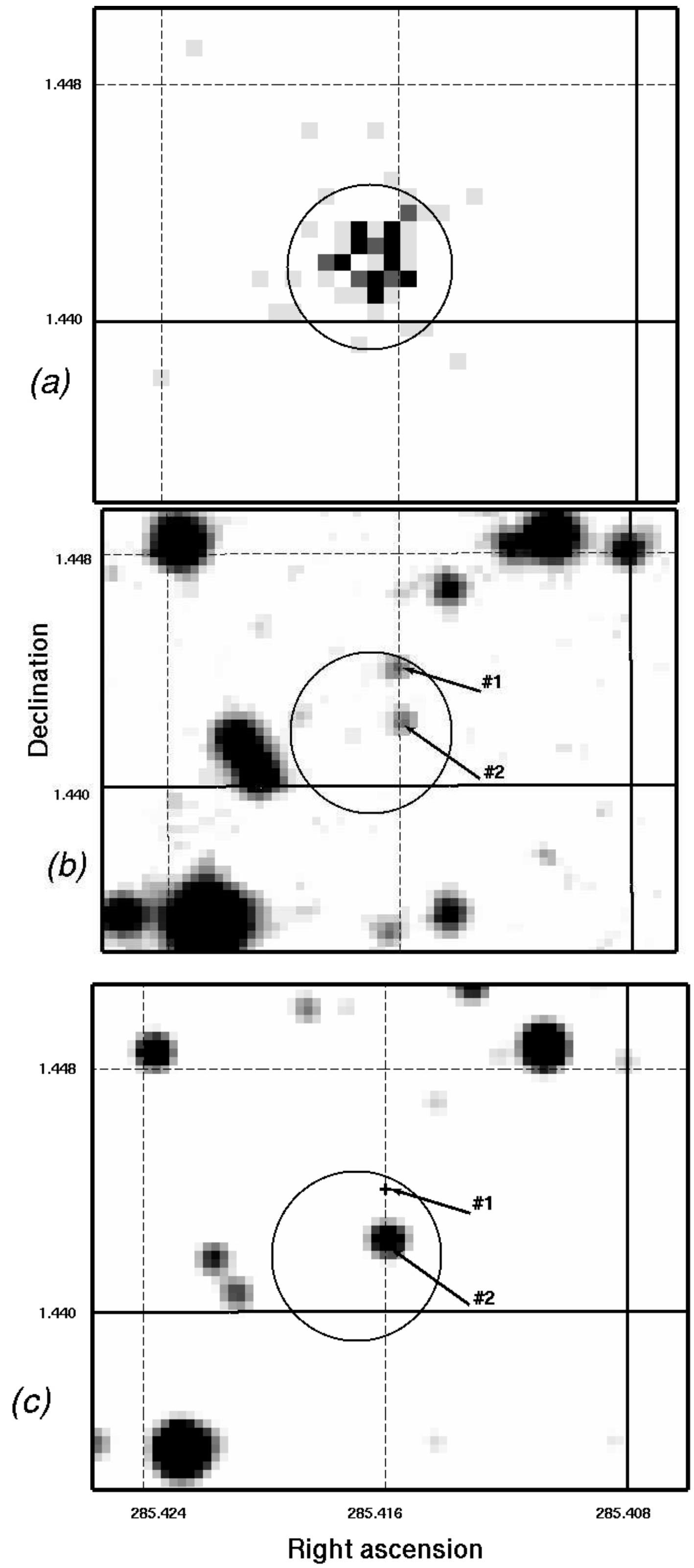

Fig. 3: Images of the sky region containing 1RXH J190140.1+012630: (a) in the energy range 0.12.4 keV based on HRI/ROSAT data, (b) in the I band based on DSS data, and (c) in the J, H, and K infrared bands based on 2MASS data. The localization center and the HRI/ROSAT localization error radius ($\sim 10''$) of 1RXH J190140.1+012630 are also marked in the images. The numbers indicate the presumed optical counterparts of 1RXH J190140.1+012630.

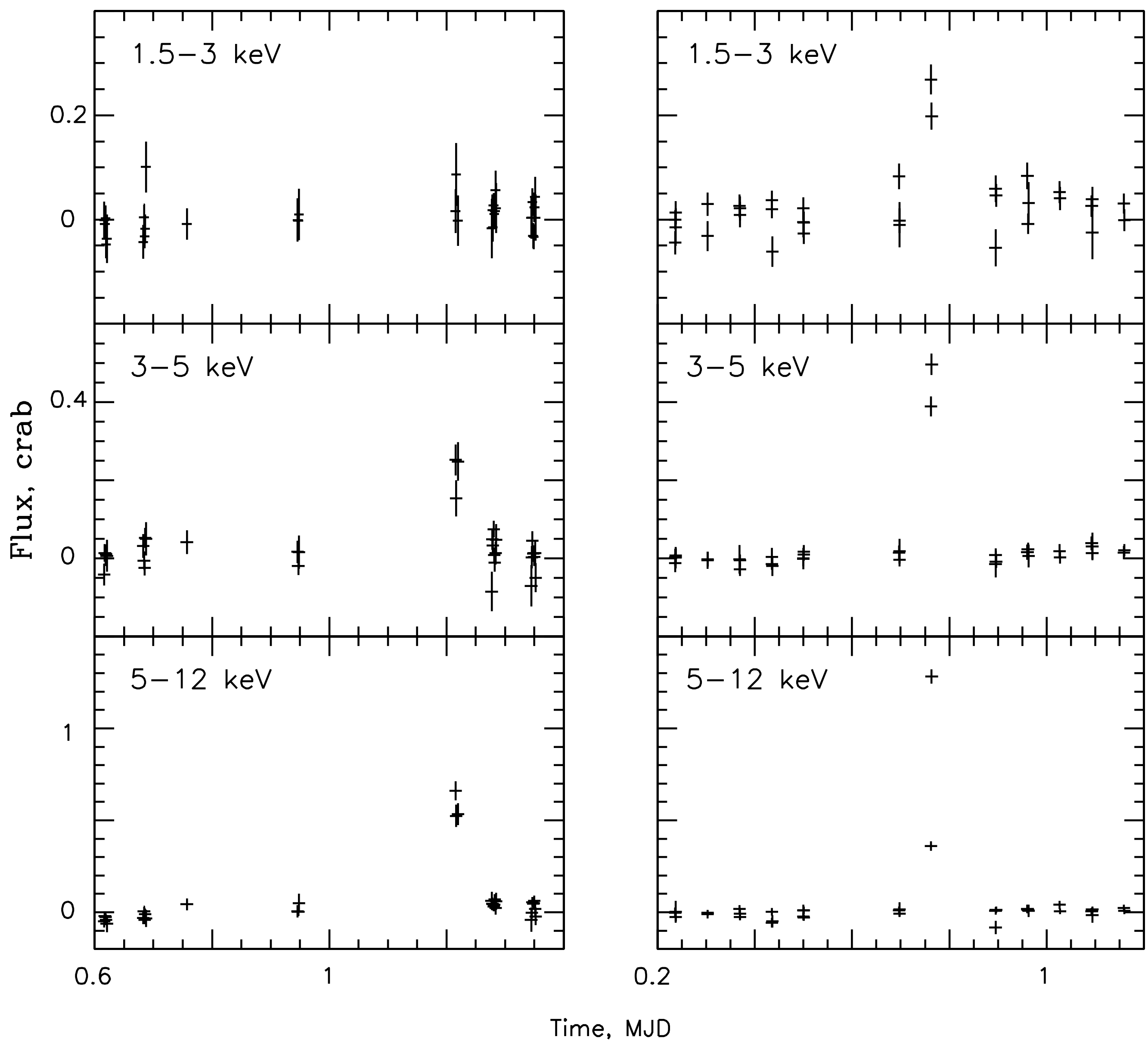

Fig. 4: ASM/RXTE light curves of XTE J1901+014 during its outburst activity: (a) July 1997 (0 corresponds to MJD 50619, UT 20.06.97 00:00:00); (b) April 2002 (0 corresponds to MJD 52370, UT 06.04.02 00:00:00). The duration of a single observing time interval is 90 s.

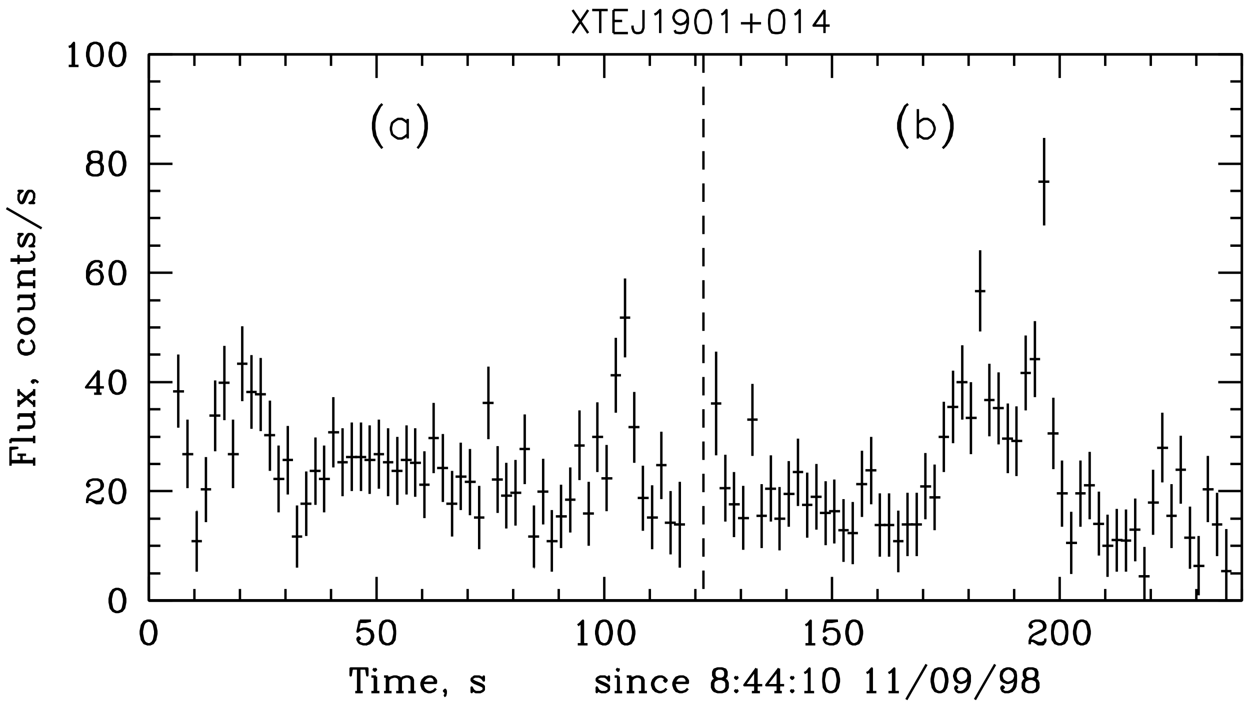

Fig. 5: PCA/RXTE (320 keV) light curves of XTE J1901+014 for observations nos. 30186-01-21-01Z (a) and 30186-01-21-01A (b), which reflect the source's aperiodic variability. The time resolution is 2 s.

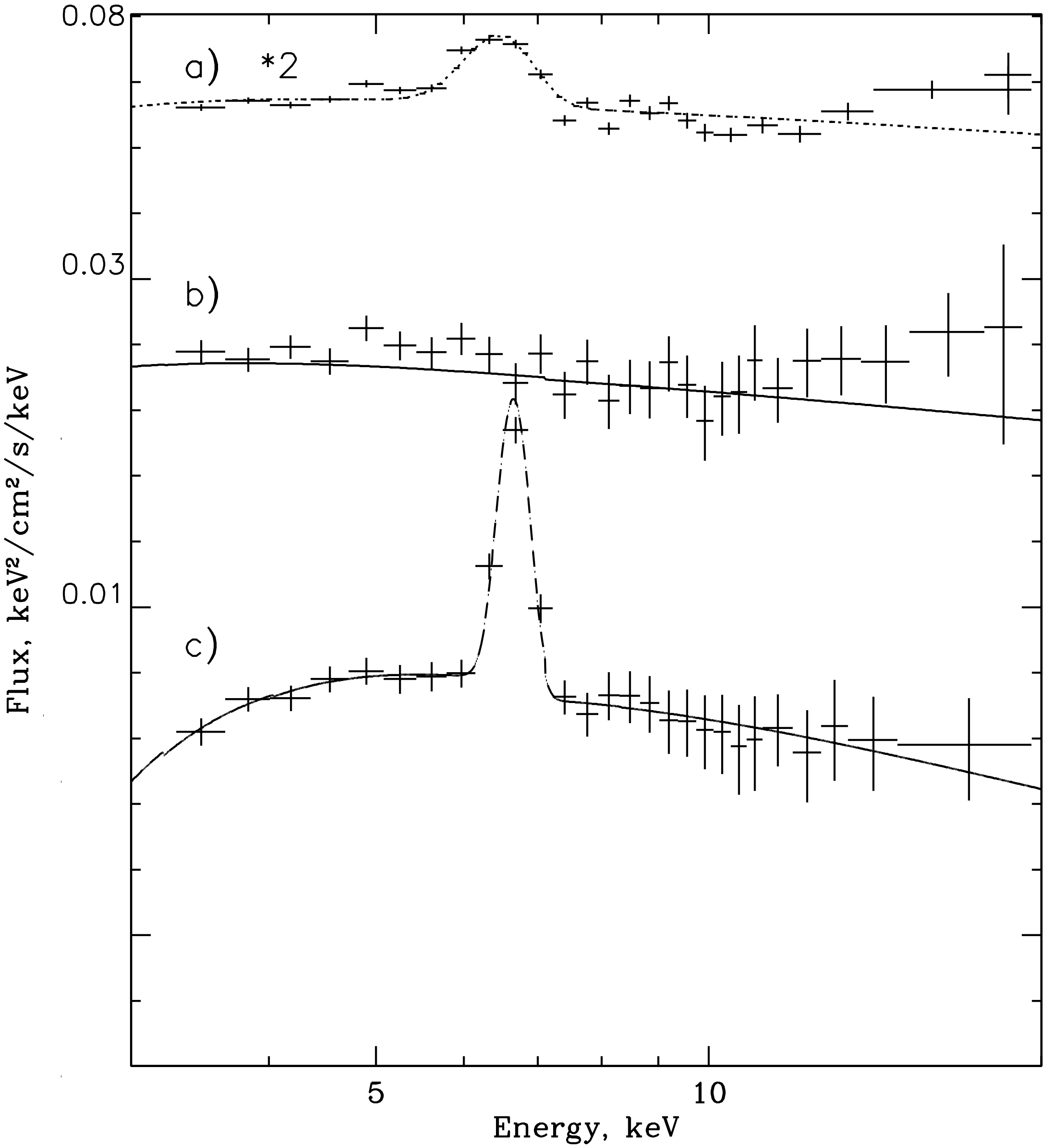

Fig. 6: **(a) Energy spectrum of the sky region with a ra- dius of 1 containing XTE J1901+014 constructed from PCA/RXTE data (the intensity was doubled for clarity); (b) the true energy spectrum of XTE J1901+014; (c) the energy spectrum of the Galactic ridge X-ray emission. The lines indicate the best fits to the spectra.**

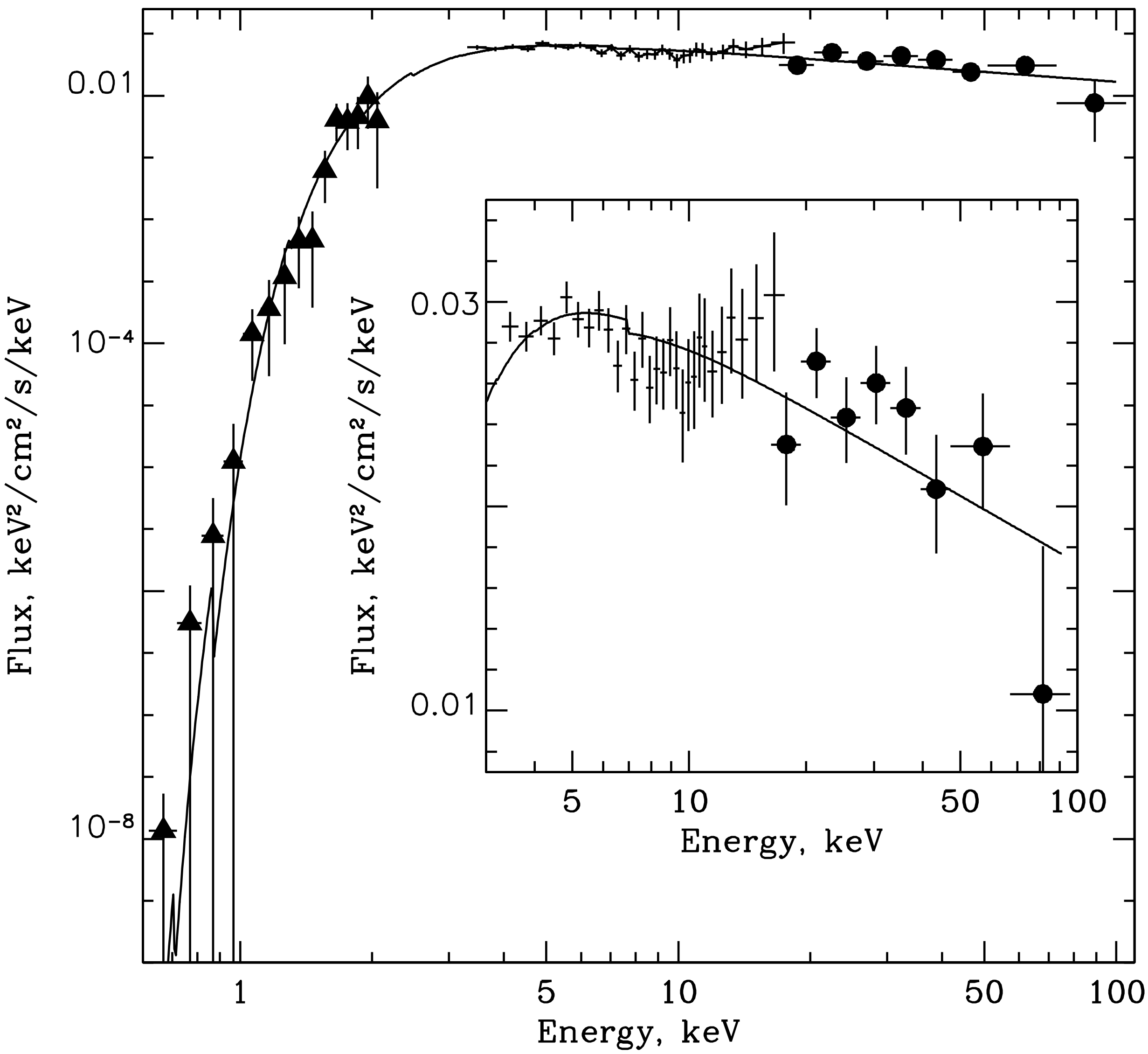

Fig. 7: Broadband (0.6-100 keV) energy spectrum of XTE J1901+014 based on PSPC-C/ROSAT (triangles), PCA/RXTE (crosses) and ISGRI/INTEGRAL (circles) data.